

LANTHANIDE DOPED TiO_x DIELECTRIC FILMS

ABSTRACT

A dielectric film containing lanthanide doped TiO_x and a method of fabricating such a dielectric film produce a reliable gate dielectric having an equivalent oxide thickness thinner than attainable using SiO_2 . A dielectric film is formed by ion assisted electron beam evaporation of TiO_2 and electron beam evaporation of a lanthanide selected from a group consisting of Nd, Tb, and Dy. The growth rate is controlled to provide a dielectric film having a lanthanide content ranging from about ten to about thirty percent of the dielectric film. These dielectric films containing lanthanide doped TiO_x are amorphous and thermodynamically stable such that the lanthanide doped TiO_x will have minimal reactions with a silicon substrate or other structures during processing.